An appraisal of Waste Management Practices in Selected Peri-Urban Communities in North Central Nigeria

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Abstract This paper examines waste management practices in peri-urban communities. Using Karu, Nasarawa State, Nigeria as a case study, the difficulties faced in localizing the sustainable development concept in Greater Karu metropolis have been identified and the waste management practices in Greater Karu assessed through a rigorous review of existing literature and an analysis of waste management practices in Karu, Nasarawa State. The study revealed a lack of proactive and sustained political support exacerbated by limited human resources and knowledge base further restricting capacity to build support and consensus amongst stakeholders. Using case study method, the paper examines the effect of waste management strategies on sustainable environment suggesting more effective roles for stakeholders and it concludes with a section on lessons learned and necessary steps for sustainable waste management of the environment.

Introduction

Waste management as a collection, keeping, treatment and disposal of waste in such a way as to render them harmless to human and animal life, the ecology and environment generally. It could also be said to be the organized and systematic dumping and channelling of waste through or into landfills or pathways to ensure that they are disposed of with attention to acceptable public health and environmental safeguards. Proper waste management will result in the abatement or total elimination of pollution [1]. Waste management in the urban setting is quite challenging. There are many problems associated with urbanisation. In many Nigerian cities and Karu is no exception, the rapid rate of growth creates inadequacies in infrastructure provisions, sanitation and general care of the environment. Oyeniyi, [2] states that the environmental challenges in Abuja and its environs including Karu resulted from population growth and the construction boom, which began in Nigeria over the past thirty years. These, inadvertently have resulted in the daily production of over 3, 000 tonnes of solid waste, most of which could not be disposed properly. Consequently, some of these have been accumulating, causing serious health and environmental damage.

Nigerian waste generation is on the increase at an estimated rate of about 0.5 – 0.7% per annum, with 2006 figures ranging from 0.4 to 0.8 Ton /capita /annum. Waste complexity is also increasing with biodegradable waste currently accounting for over 50% or over 50 million tons per annum average waste burden on the nation with less than 10% waste management capacity [3]. This waste management capacity is generally provided and delivered by public sector. Commercial waste management services are still in the fledgling stages as there is poor national policy framework, infrastructural capacity and manpower. In the past, Nigerian development policies have been poorly coordinated and, are highly dominated by economic objectives so; environmental protection is low ranked as the populace fail to see the direct connection between the health of the environment and societal wellbeing. Moreover, available funding for this enterprise is government possession. The hydra-

headed monster of corruption and low private sector participation has ensured that private sector participation in waste management is poor.

Less than one percent (1%) of Nigerian GDP is spent annually on waste management with Lagos State and Rivers State leading nationally in monthly waste collection and disposal expenditures of N300 million and N100 million respectively. This is far less than the recommended standard of three to five percent (3-5%) of national GDP. Nigeria has over thirty five percent (35%) of her population living in the cities with a growing urbanization rate of about 7% per annum and less than ten percent (10%) of the city populations enjoying marginal waste management services [3].

Waste Management has become an area of major concern in Nigeria today [4]. The environment appears to be a battlefield with the waste generated gaining the upper hand. Nigeria appears to be a losing the battle against the harmful consequences of unguided waste disposal and the attainment of a clean healthy environment for all Nigerians. It is a common sight in many Nigerian cities today to see heaps of waste accumulating in festering dumps of our urban landscape. In spite of the gains in waste management in Nigeria, like the Sustainable Cities Programme by the United Nations Habitat the problems exist as outlined by Attah [1] to include:

1. Lack of Adequate Funding and Uncontrolled Population
2. Lack of Trained / Professional Waste Managers
3. Lack of Effective Monitoring and Control
4. Peculiarity of the Nigerians' Attitude of "government-does-everything" philosophy
5. Lack of Modern Technology
6. Lethargy in Implementing Efficient Waste Management Methods

Profile of the Study Area

The city of Karu lies east of Abuja, Nigeria's capital city. Karu is the administrative headquarters of the Karu Local Government area, which is one of the 13 local government areas that make up Nasarawa State. It was created in October 1996 from the old Plateau State by the administration of late Gen. Sani Abacha. Greater Karu, consisting of Karu and its outskirts has population of 216, 230 according to the 2006 census, but with an estimated 22.7% increase as opposed to 9.3% for Abuja! (The population at 2004 was projected at 750,000 and was projected at 2million for 2015 by a UN-HABITAT study [5]. Karu covers a land area of 2,938 square kilometres. The Local Government is split into three development areas (Karu, Karshi and Panda) for administrative purposes [5]. The precise boundaries and population of Karu metropolis are difficult to establish as it consists of about eight main settlement areas that sprawl across the Abuja- Keffi expressway, and even spill over from Nasarawa into the FCT.

Karu Local Government was created in October 1991 out of the old Keffi Local Government. It shares boundaries with the Federal Capital Territory to the west, Nasarawa LGA in the south and Keffi Local Government to the east. (See figure 2.)The area's indigenous population consisted of a few tribes, with the Gbagyi being the dominant. Historically the indigenes were mainly engaged in agricultural activities. After the relocation of the seat of the Government of Nigeria from Lagos to Abuja in 1991, the population of Abuja grew very rapidly from 371,674 in 1991 to 1.4 million in 2006, representing an average annual growth rate of 9.3 percent for that 15-year period. In 1991, Karu's population was approximately 10,009, and it grew at an astounding rate of 22.7 percent annually to reach 216,230 by 2006. This was largely made possible since Karu did not have the strict oversight of regulatory agencies, being so far from the capital of Lafia. Karu has been able to grow due to Abuja's inability to accommodate the migrant workers and the need for affordable housing. This has put a severe strain on satellite towns and cities such as Karu in Nasarawa State. Karu in particular has struggled to bear the burden of this growth, as it lacks good quality shelter, well-functioning water supply, waste and sanitation systems, and other basic urban services [6].

Water supply infrastructure and waste management systems are both highly inadequate, if not non-existent, in the vast majority of Karu's neighbourhoods. Electricity supply from the Power Holding Company of Nigeria is also erratic, which frustrates both domestic and commercial users. While there are decent healthcare and education facilities in Karu, the government facilities are significantly underfunded affecting the quality of their

services. Public transport in and around Karu is disorganized, and characterized by deteriorating roads and frequent traffic congestion [5].

Like most urban communities in the developing world, Karu suffers from varied and serious environmental problems such as indiscriminate waste disposal sites, noise and air pollution from local transport sources, and blocked water drainage systems. The outskirts of Karu are also subjected to environmental problems arising from poor agricultural techniques such as the inappropriate use of agrochemicals and unrestricted harvesting of trees

The institutional framework for urban governance in Karu is complex and cumbersome. Federal and state ministries, the Federal Capital Territory administration, Nasarawa State and Karu Local Government are all involved in some aspects of governance of Karu. Service delivery is largely undertaken by a mixture of local or state agencies, some private sector agents, and people at the community level. The number of actors involved in the urban planning process tends to complicate management systems and ultimately stifle progress.
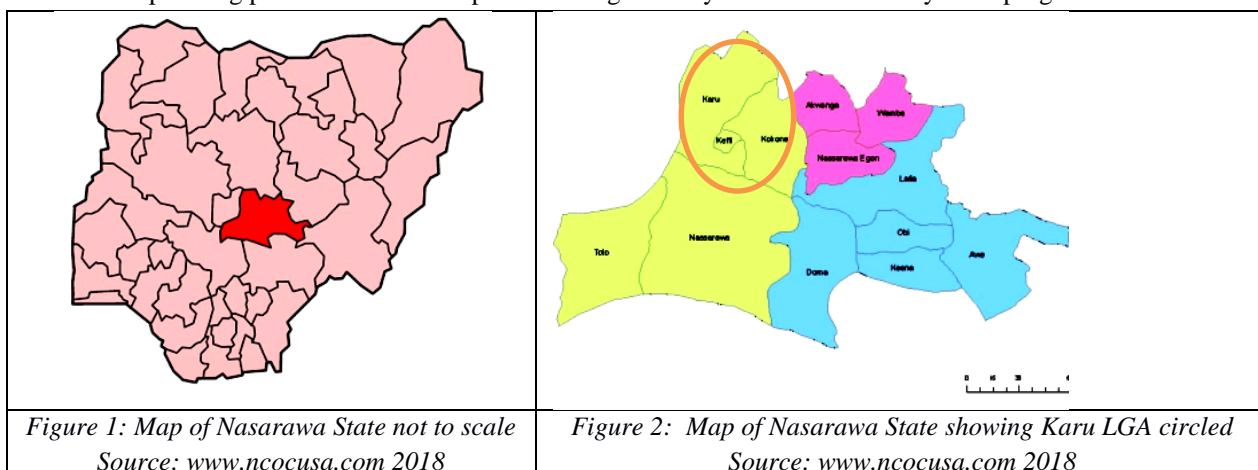
Figure 1: Map of Nasarawa State not to scale *Source: www.ncocusa.com 2018*	*Figure 2: Map of Nasarawa State showing Karu LGA circled* *Source: www.ncocusa.com 2018*

Figure 3: Karu satellite image
Source: (Google Earth 2018)

Research Method

This study adopted a case study approach to appraise waste management practices of Karu, Nasarawa State. Karu was selected due to the peri-urban nature of several informal settlements in this city. This research design was used because it sheds light on the unique characteristics of the sampled population, and because it helps to compare the findings of this research with the literature reviewed. Data was drawn from primary and secondary sources. The secondary data involves the use of information already in existence and this was sourced largely through rigorous literature review. Descriptive analyses as well as quantitative and inferential analyses were

conducted. All attributes and indicators of waste management were considered and analysed for each category identified for analysis in the communities.

Primary data used was acquired through direct field measurement, questionnaire survey and interview methods. A random sample method of data collection was employed with eighty questionnaires distributed in the areas in Karu. Of the questionnaires distributed, sixty were returned, representing a 75% return. The questionnaire which was used to gather primary data was divided into four broad sections, with each section containing variables such as condition of houses, physical and social infrastructural facilities and services, and socio-economic/cultural setting. In order to aid primary data collection, a series of interviews were conducted with the few willing residents and staff of the local government to gather additional data. Interviews were also conducted with staff of the Nasarawa State Urban Development Board and relevant stake holders in the community.

Analysis of data collected from Karu

Figure 4 shows Percentage Distribution of the sampled population by gender shows that males were the majority of respondents sampled (65%). Figure 5 shows the percentage distribution of the sampled population by educational background shows that the majority of respondents (83%) had some form of tertiary education. Figure 6 indicates the percentage distribution of the sampled population by residency. It shows that majority (57%) of respondents reside in Karu.

Figure 7 indicates the Percentage distribution of the sampled population by occupation. It shows that majority (67%) of respondents reside in multiple room bungalows. Figure 8 indicates the Percentage Distribution of the sampled population by occupation. It shows that 47% of respondents are home owners. Figure 9 indicates the accessibility of the sampled population to roads with direct vehicular access. It shows that majority (68%) of respondent's homes have roads with direct vehicular access. Figure 10 indicates percentage distribution of the sampled population by sources of water supply. It shows that majority (70%) of respondents use boreholes or deep wells. Figure 11 indicates percentage distribution of the sampled population by sources of power supply. It shows that majority (58%) of respondents use generating sets due to non-connection to the national grid. Figure 13 indicates Percentage Distribution of the sampled population by places used by toileting. Though 83% of the respondents claim access to private toilets 69% of respondents use other places perhaps due to the poor conditions of the private toilets. Figure 12 indicates percentage distribution of the sampled population by sources of water supply. It shows that majority (83%) of respondents have access to private toilets. Figure 14 indicates Percentage distribution of the sampled population by method of private toilet effluent disposal. It shows that majority (65%) of respondents use septic tanks. Figure 15 indicates percentage distribution of the sampled population by types of schools in sampled community. It shows that private schools constitute the majority (67%) of schools in the area. Figure 16 indicates percentage distribution of the sampled population by types of market. It shows that majority (45%) of respondents reside near perishable food markets. Figure 17 indicates Percentage distribution of the sampled population by types of hospitals. It shows that majority (55%) of respondents use government hospitals. Percentage distribution of the sampled population by types of hospitals. Figure 18 indicates Percentage distribution of the sampled population by types of waste generated. It shows that majority of respondents generate combustible waste in their community. This cuts across the four focus groups. It is noted that the liquid effluent is generated mostly by the hospitals and associated institutions. Figure 19 indicates percentage distribution of the sampled population by sources of power supply. It shows that majority (58%) of respondents use generating sets due to non-connection to the national grid.
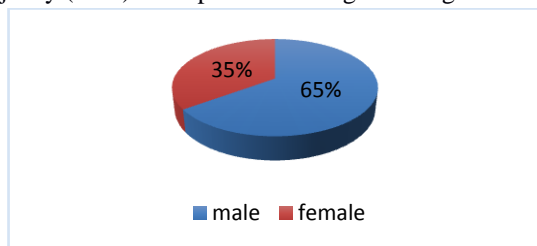

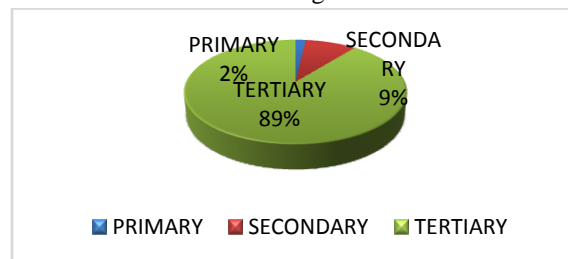*Figure 4: Percentage Distribution of the sampled population by gender*

Figure 5: Percentage distribution of the sampled population by educational background
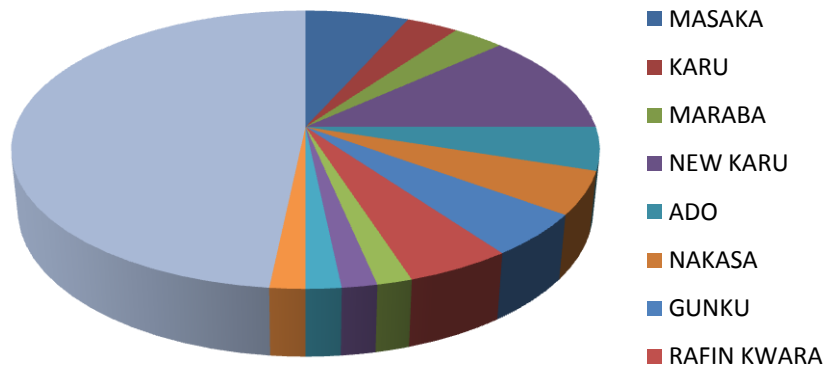
Figure 6: Percentage Distribution of the sampled population by residency
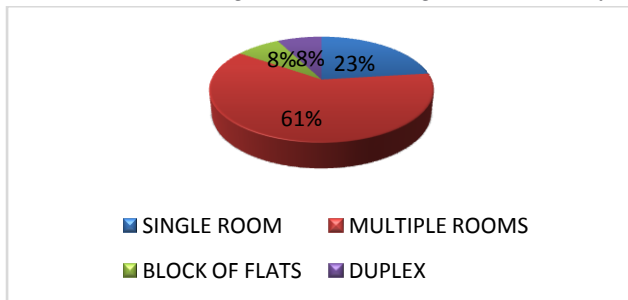

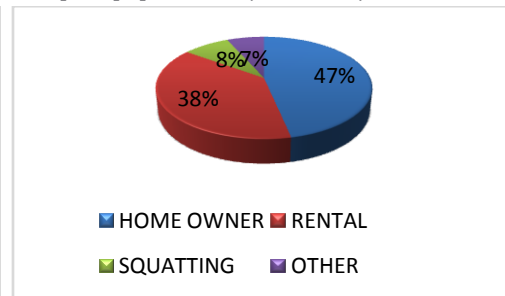*Figure 7: Percentage Distribution of the sampled population by type of residence*

Figure 8: Percentage Distribution of the sampled population by home ownership

Accessibility of Sampled Community to roads with direct vehicular access

Figure 9: Percentage distribution of the sampled population by roads with direct vehicular Access
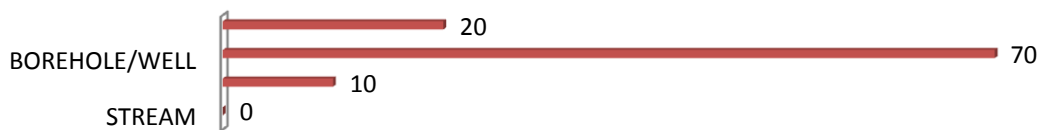
Sources of Water Supply in the Sampled Community

Figure 10: Percentage distribution of the sampled population by sources of water supply

Sources of Electricity Supply in the Sampled Community

Figure 11: Percentage distribution of the sampled population by sources of power supply

Type of Toilet Available in the Sampled Community

Figure 12: Percentage Distribution of the sampled population by sources of water supply

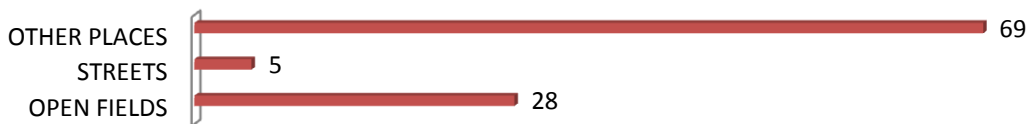**Places used for Toileting in the Sampled Community**

Figure 13: Percentage Distribution of the sampled population by sources of water supply

Private Toilet Effluent Disposal Method in the Sampled Community

Figure 14: Percentage distribution of the sampled population by method of private toilet effluent disposal

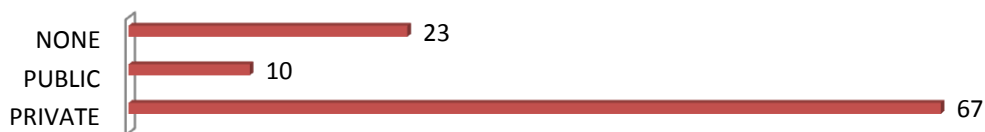**Types of Schools in Sampled Community**

Figure 15: Percentage distribution by types of schools in sampled community

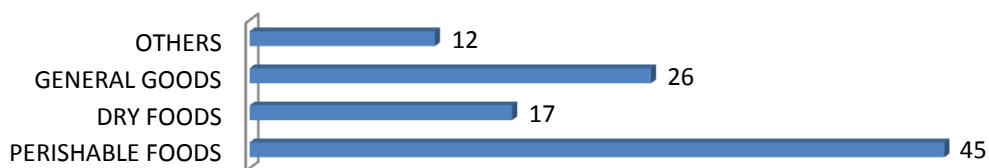**Types of Markets in Sampled Community**

Figure 16: Percentage distribution of the sampled population by types of markets

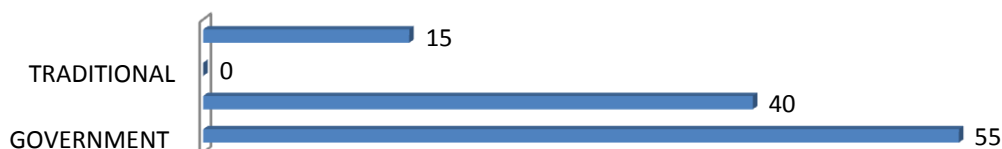**Types of Hospitals in Sampled Community**

Figure 17: Percentage distribution of the sampled population by types of hospitals
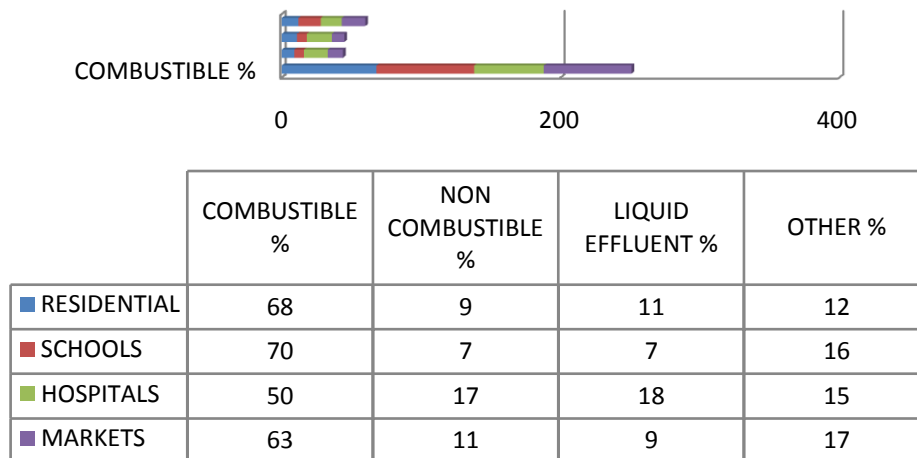
Types of Waste Generated in the Sampled Community

COMBUSTIBLE %

	COMBUSTIBLE %	NON COMBUSTIBLE %	LIQUID EFFLUENT %	OTHER %
■ RESIDENTIAL	68	9	11	12
■ SCHOOLS	70	7	7	16
■ HOSPITALS	50	17	18	15
■ MARKETS	63	11	9	17

Figure 18: Percentage distribution of the sampled population by types of waste generated

Methods of Waste Disposal in the Sampled Community

OTHER %
IMPROVISED INCINERATOR %
WASTE BINS %

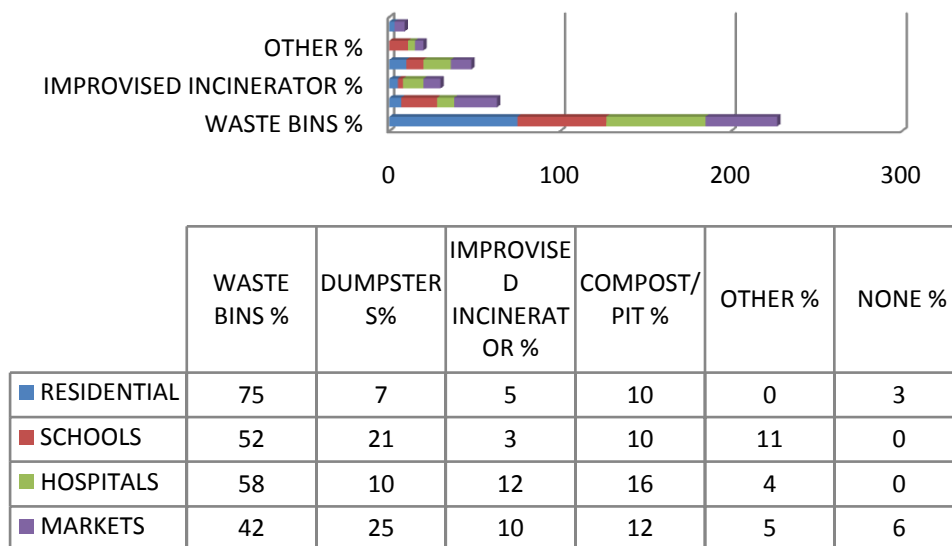|	WASTE BINS %	DUMPSTERS%	IMPROVISED INCINERATOR %	COMPOST/ PIT %	OTHER %	NONE %
■ RESIDENTIAL	75	7	5	10	0	3
■ SCHOOLS	52	21	3	10	11	0
■ HOSPITALS	58	10	12	16	4	0
■ MARKETS	42	25	10	12	5	6

Figure 19: Percentage Distribution of the sampled population by methods of waste disposal

Discussion

Plate 1-2: Commercial activity along Abuja-Keffi Expressway& PHCN installation: turned a dumping ground for solid waste

Plate 3: Commercial activity along Abuja-Keffi Expressway: a source of waste generation

Karu is regarded as the economic growth engine of Nasarawa State because of its proximity to the Federal Capital City of Abuja [6]. It has been described as one of the fastest growing urban areas in the world with 40% growth rate annually. A drive through Karu, which has several settlements including Masaka, Ado and Maraba reveals heaps of combustible waste deposited along the Keffi-Abuja Expressway, the waste has been deposited on the shoulders, the islands and any available open space (see Plates 1 and 2 and figure 18).

Plate 4: World Bank truck

Plate 5: Land fill Compactor

Plate 6: Land fill at Mararaba

Plate 7: Landfill coordination office

Lined up along the expressway are mixed use facilities, shops, offices banks, filling stations, residential buildings, mini – industrial outfits such water sachet packaging activities etc. Each of these activities generates a large volume of waste with no designated waste dump in the locality (See plates 1-2). Waste generated from these activities is dumped by the road on a daily basis. (See plate 3). The agency for waste management is the Nasarawa Urban Development Board, (NUDB). Prior to this, waste management activities were coordinated informally by the local government through monthly environmental sanitation exercises. Karu was also fortunate to participate in Sustainable Cities Programme in Nigeria under the auspices of United Nations Centre for Human Settlements/United Nations Human Settlements Programme (UN-HABITAT) and United Nations Development Programme. This programme started in Nigeria in Ibadan in 1994, one year after the ratification of the Agenda 21 in Nigeria [7]. Karu was included in the programme in 2001 with the preparation of the Karu environmental profile by consultants. Attempts at addressing waste management problems in Karu by the Nasarawa State Government and World Bank assisted programme resulted in the development of a land fill

waste dump site at Mararaba in 2006. The scheme involved excavating a large open pit and building concrete walls around it with an entrance gate. Waste generated in Karu are evacuated or carted away in waste bins mounted on small trucks which are mechanically operated (see plates 4-5). These are emptied into the pit and a compactor shreds these wastes into smaller units mixed with the sand and pushed into the pit. This is eventually sand filled for decomposition and compaction. (See plates 6-7). This however is not so effective in the rainy season. Moreover, since the land fill is not in a remote location, the odour makes the office environment not conducive for the workers to operate in it. The programme was done on a pilot scale and handed over to the Nasarawa State Government. Pilot schemes successfully executed are meant to provide operational structures to be replicated in different parts of the local government and thus bring about a revitalisation of waste management that can be professionally handled.

Indeed Karu has enjoyed significant support from donor agencies in the past, perhaps being so close to the seat of the Federal Government, yet the impact of Agenda 21 in relation to waste disposal has not been significantly felt down to the grass roots [7]. This in part is due to underfunding of counter contributions to complement foreign donor agencies; non-involvement by stake holders and the local government authorities. Funding from government is not guided and sustainable as solutions are not home grown. Moreover, issues of the environment are handled at the state level excluding the local government.

All waste management procedures in Karu have been vested purely as an administrative purview of NUDB. Before 2008, the environmental issues of Karu were the exclusive reserve local government [6,8]. On inquiry from the NUDB, Western zonal office, there was a policy decision taken to instruct the community members to drop their waste on the expressway for collection by the waste trucks. This decision was made without due consultation with environment professionals and without verifying the amounts of waste generated. This singular act led to the accumulation of waste on the highways islands, curbs and shoulders as the waste dropped for collection far exceeded the capacity of the NUDB. This accounts for the waste overspill observed on the expressway, the government through its agent NUDB has devised a new strategy of engage for waste disposal through the purchase of more waste equipment and trucks. An additional six trucks have been purchase with two pay loaders for daily operation. The purchase of this has reduced the impact of waste on access roads, but largely left the volume of waste in the residential areas, where vehicular access is impeded, unattended.

It was observed that the sanitation habits of Karu residents are varied. There are those with clean environmental habits (see plate 8-9) who clean their gutters and streams around their vicinity, while other simply empty their waste into the same and get them filled up, (See plates 10-11) thereby blocking the flow of water and in most cases leading to flooding of streams, gutters and drainage. Several residents were noticed to be keeping their environment clean and tidy on daily basis without any coercion.

Identified problems attested by the NUDB officials are listed as follows:

1. There are no dump sites in the different area in Karu to accommodate the waste management needs of the different categories of users of the built environment in Karu.
2. Land in Karu has become a goldmine and because of this it is in hands of the local owners. Prices are more than tripled in multiples of millions of Naira depending of the plot sizes. Government is finding it difficult to acquire large enough portions of land for landfill.
3. Between 40-60 percent for the residences in Karu are not accessible by vehicles. This pose a difficult situation for the NUDB trucks to evacuate waste.
4. The trucks can only evacuate solid wastes, most liquid wastes is left unattended to.
5. For a population of nearly 2 million people in Karu LGA, only one land fill as a waste disposal site is grossly inadequate.
6. Undeveloped properties, fenced or left unfenced are turned into waste disposal sites and in some cases these are not accessible.
7. The number of trucks is grossly inadequate.
8. The number of trucks is greatly a limiting factor in achieving a sufficient level of waste management structures for Karu.

Plate 8: Clean gutters at Old Karu   *Plate 9: Well maintained environment, Old Karu*

Plate 10: Poorly maintained gutter & drainage Plate 11: Blocked stream with waste, Karu Old Karu
Source: Authors' Field Survey 2013

Impact of Waste Management Practices among Inhabitants of Karu

Of the respondents' survey 100% in the hospitals and schools made use of some form of waste disposal system. In the residential and markets 97 percent and 94 percent respectively also made use of some form of waste disposal instrument. Majority of the respondents made use of waste bins (75 percent in residential; 52 percent in schools; 58 percent in hospitals and 42 percent in markets) which suggests user initiative as government dumpster constitute only 7 percent for residential; 21 percent in schools; 10 percent in hospitals and 25 percent in markets. This user initiate reveals that the impact of Agenda 21 has been made in the study area of Karu significantly as inhabitants are aware of the need to maintain a healthy environment [7, 9].

Conclusion

The findings reveal that Karu is not a hard ground for waste management. The principles of waste management have actually begun to bear some fruit as households are seen deliberately cleaning and keeping their environment tidy by packaging their waste in polythene bags and disposing of them at designated points. A country grown implementation of the Millennium Development Goals with continuous financial contributions from all stakeholders would ensure that the targets adopted by this declaration can be achieved.

Recommendations

This study is a wake-up call to policy-makers and stakeholders in Karu. The rapid expansion of Karu due to its proximity to Abuja and the attendant strain on the existing facilities makes it imperative for intervention not only from the state government but the local government as well. While international donor agencies have made some contributions like the pilot scheme through the sustainable Cities programme which ended in 2006 and various World Bank interventions which led to the establishment of the land fill. This should be replicated to different zones and locations for effectiveness.

Sustainable gains can be made by adopting the following strategies:

1. A total review of the operations and activities of the Nasarawa Urban Development Board with a view to incorporating contributory participation from the generators of waste. In other words, the waste generator will pay for the disposal of the waste he or she generates (Waste- Generator-Pays-Principle or WGPP).

2. Waste collection should be localised in the various wards within easy reach of the inhabitants and efforts should be made towards urban renewal where possible by upgrading of slum areas creating the enabling environment for proper waste management accessibility [10].

3. The practice of good urban governance as advocated by UN HABITAT through actual accountability to the taxpaying citizenry should be seen to be done. Local government should not be spectators in the management of waste in Karu but should be active participants as well as the residents and other occupants of various built environments and the attendant facilities.

4. There should be advocacy though public enlightenment programs as to the dangers of poor waste management in Karu. Once the advocacy has the necessary impact, individuals will not rely on government to force them to do what they ordinarily should do for their own good.

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